Review of Shellfish Fisheries in Northern British Columbia to 1984

S. Farlinger and K.T. Bates

Department of Fisheries and Oceans
Prince Rupert, B.C. V8J 1G8

November, 1985

Canadian Manuscript Report of
Fisheries and Aquatic Sciences
No. 1841

86-0989/

Canadian Manuscript Report of Fisheries and Aquatic Sciences

Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional problems. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Manuscript reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1–900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 901–1425 were issued as Manuscript Reports of the Fisheries Research Board of Canada. Numbers 1426–1550 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Manuscript reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Les rapports manuscrits contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui traitent de problèmes nationaux ou régionaux. La distribution en est limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports manuscrits peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports manuscrits sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1 à 900 de cette série ont été publiés à titre de manuscrits (série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés comme manuscrits (série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros 901 à 1425 ont été publiés à titre de rapports manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 sont parus à titre de rapports manuscrits du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 1551.

Les rapports manuscrits sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Manuscript Report of

Fisheries and Aquatic Sciences 1841

November 1985

REVIEW OF SHELLFISH FISHERIES IN NORTHERN BRITISH COLUMBIA TO 1984

by

S. Farlinger and K.T. Bates

Department of Fisheries and Oceans

Prince Rupert, B.C.

V8J 1G8

• Minister of Supply and Services Canada 1985
Cat. No. Fs 97-4/1841 ISSN 0706-6473

Correct citation for this publication:

Farlinger, S and K.T. Bates. 1985. Review of shellfish fisheries in northern British Columbia to 1984. Can. MS Rep. Fish. Aquat. Sci. 1841: 35 p.

CONTENTS

List of Figures..... iv

List of Tables..... iv

List of Appendices..... v

Abstract/Résumé..... vi

Introduction..... 1

General..... 1

Crab fishery..... 5
Species harvested..... 5
Regulations..... 5
Landings..... 5

Shrimp fishery..... 6
Shrimp fishery by trap..... 6
Species harvested..... 6
Regulations..... 9
Landings..... 9

Shrimp fishery by trawl..... 9
Species harvested..... 9
Regulations..... 9
Landings..... 12

Geoduck fishery..... 12
General..... 12
Regulations..... 12
Landings..... 14

Abalone fishery..... 14
General..... 14
Regulations and surveys..... 14
Landings..... 17

Clam fishery..... 17
Species harvested..... 17
Regulations..... 17
Landings..... 19

Octopus fishery..... 19
Regulations..... 19
Landings..... 19

Scallop fishery..... 19
Species harvested..... 19
Regulations..... 22
Landings..... 22

Squid fishery..... 22
Regulations..... 22
Landings..... 22

Acknowledgements..... 22

References..... 23

Appendices..... 24

LIST OF FIGURES

Figure

1. Location of Statistical Areas in northern British Columbia..... 2

2. Location of Statistical Areas in British Columbia..... 3

3. Cumulative crab landings by month in northern B.C., 1983 and 1984..... 5

4. Shrimp trap landings by month in northern B.C., 1984..... 11

5. Shrimp trawl landings by Statistical Area in northern B.C., 1984..... 11

6. Shrimp trawl landings by month in northern B.C., 1984..... 11

7. Proportion of British Columbia abalone catch by Statistical Area, 1984.. 18

LIST OF TABLES

Table

1. Category of licence required, landings and estimated value of shellfish fisheries in northern B.C.,1984..... 4

2. Number of licensed vessels and their utilization in shellfish fisheries in British Columbia, 1984..... 4

3a. Crab landings by month and Statistical Area in northern B.C., 1983..... 7

3b. Crab landings by month and Statistical Area in northern B.C., 1984..... 8

4a. Annual landings and effort for shrimp trap fishery, B.C., 1981-1984.... 10

4b. Annual landings and effort for shrimp trawl fishery, B.C., 1981-1984... 10

5a. Annual geoduck quotas (lb) for northern B.C., 1981-1984 13

5b. Annual geoduck quotas (kg) for northern B.C., 1981-1984..... 13

LIST OF TABLES (cont'd)

6. Geoduck landings and fishing effort by Statistical Area (1-10) in northern B.C., 1984..... 15

7. Annual geoduck landings by Statistical Area (1-10) in northern B.C., 1981-1984..... 16

8. Abalone landings by Statistical Area (1-27), B.C., 1984..... 18

9. Annual clam landings by Statistical Area (1-10) in northern B.C., 1970-1984..... 20

10. Annual landings of razor clams in Area 1, B.C., 1979-1984..... 21

11. Octopus landings by Statistical Area in northern B.C., 1984..... 21

12. Octopus landings by gear type in northern B.C., 1984..... 21

13. Squid landings by Statistical Area in northern B.C., 1984..... 22

LIST OF APPENDICES

Appendix

1. Commercial crab closures in northern B.C., (Areas 1-10)..... 24

2. Comparison of catch statistics from shrimp trap "Z" logs and sales slip data for 1984..... 25

3. Commercial sampling summary for northern B.C. shrimp trap fishery to January 1, 1985..... 26

4. Length frequencies for northern B.C. commercial prawn samples, 1984.... 27

5. Shrimp trap landings by Statistical Area in northern B.C., 1984..... 29

6. Mean annual abalone catch per vessel and diver, and fishing effort, B.C. 1977-1984..... 30

7. Annual abalone port sampling summary, Prince Rupert, B.C., 1982-1985... 31

8. Range in abalone landings per licence holder, B.C., 1984..... 31

9. Annual landings of abalone in B.C., 1952-1984..... 32

Append. Fig. 9-1. Annual British Columbia abalone catch by year, 1952-1984. 32

10. Annual abalone catch by Statistical Area, B.C., 1977-1984..... 33

11. Annual abalone fishing effort by Statistical Area, B.C., 1977-1984..... 34

Append. Fig. 11-1 CPUE (kg/diver day) for B.C. abalone fishery, 1977-1984.. 35

ABSTRACT

Farlinger, S. and K.T. Bates 1985. Review of shellfish fisheries in northern British Columbia to 1984. Can. MS Rep. Fish. Aquat. Sci. 1841: 35 p.

Shellfish fishery landings for northern British Columbia (north of Cape Caution) were valued conservatively at 2.85 million dollars in 1984. History, licencing, management strategy and 1984 fishing information are included in this report. Catch data for each shellfish fishery cover the period since the most recent publication.

Key words: shellfish fisheries in northern British Columbia, history, management, catches.

RÉSUMÉ

Farlinger, S. and K.T. Bates 1985. Review of shellfish fisheries in northern British Columbia to 1984. Can. MS Rep. Fish. Aquat. Sci. 1841: 35 p.

Les débarquements de mollusques et de crustacés du nord de la Colombie-Britannique (au nord de cap Caution) ont été évalués de manière prudente à 2,85 millions de dollars en 1984. Ce rapport porte sur l'historique, la délivrance des permis, la stratégie en matière de gestion et les données de 1984 sur la pêche. Les données pour chaque pêche de crustacés et de mollusques couvrent la période depuis la plus récente publication.

Mots-clés: pêches de mollusques et de crustacés dans le nord de la Columbie-Britannique, historique, gestion, prises.

INTRODUCTION

The shellfish fisheries in British Columbia have a secondary and fluctuating importance compared to other fisheries. This is due to several factors including the length and success of the fishing season of other fisheries (eg. salmon, herring and groundfish), natural fluctuations in target species of shellfish populations, and the general economic conditions. As a result of this "backseat" nature of the B.C. shellfish fisheries, they have been inconsistently documented in the past with some notable exceptions referred to below.

This report is intended to document the landings, history, management and expansion of shellfish fisheries in the northern British Columbia. The abalone fishery, which previously has been reviewed separately (Bates 1984, 1985; Sprout 1983; Fedorenko and Sprout 1982), is now included with other shellfish species. It is hoped that this documentation will facilitate review and development of the shellfish fisheries management, while providing a record of activities in the northern B.C. division.

In order to provide for data continuity in this report, landings of the major shellfish species cover the period since the most recent publication and these are included in the reference list. In this report, all tonnage is given in metric tons or tonnes (1 tonne = 1,000 kg) unless otherwise indicated. Northern B.C. is defined here as the area north of Cape Caution consisting of Statistical Areas 1-10 (Fig. 1). Location of Statistical Areas in northern and southern British Columbia is shown in Figure 2.

GENERAL

In 1984, the minimum estimate of the landed value of shellfish in northern B.C. was 2.85 million dollars (Table 1). The contribution of individual shellfish species to northern B.C. fisheries has been inconsistent since the early 1900's. For example, the crab fishery harvest is currently at a low level while the prawn and geoduck fishery landings are increasing. Also, the abalone vessel quotas and thus landings are presently reduced as these stocks continue to decline. Fisheries already established in the southern B.C., such as sea urchin and sea cucumber, remain only potential fisheries in the north.

As the fishing time is reduced in salmon and herring fisheries, more effort is being directed toward the shellfish species. In some cases, such as the crab and shrimp fisheries, there are many more vessels eligible to fish than actually do participate. In the case of geoduck and abalone fisheries, limited entry has kept the number of vessels low (Table 2). None of these fisheries are licenced by area so that, with only a few exceptions, all eligible vessels may operate in any zone that is open to fishing.

Specific licence requirements are described below for each type of shellfish fishery. In general, management plans for these fisheries are set the preceding fall with information provided by fishery officers, fishermen, management biologists and, where applicable, researchers. As the shellfish fisheries expand, more attention and resources are required for responsible management.

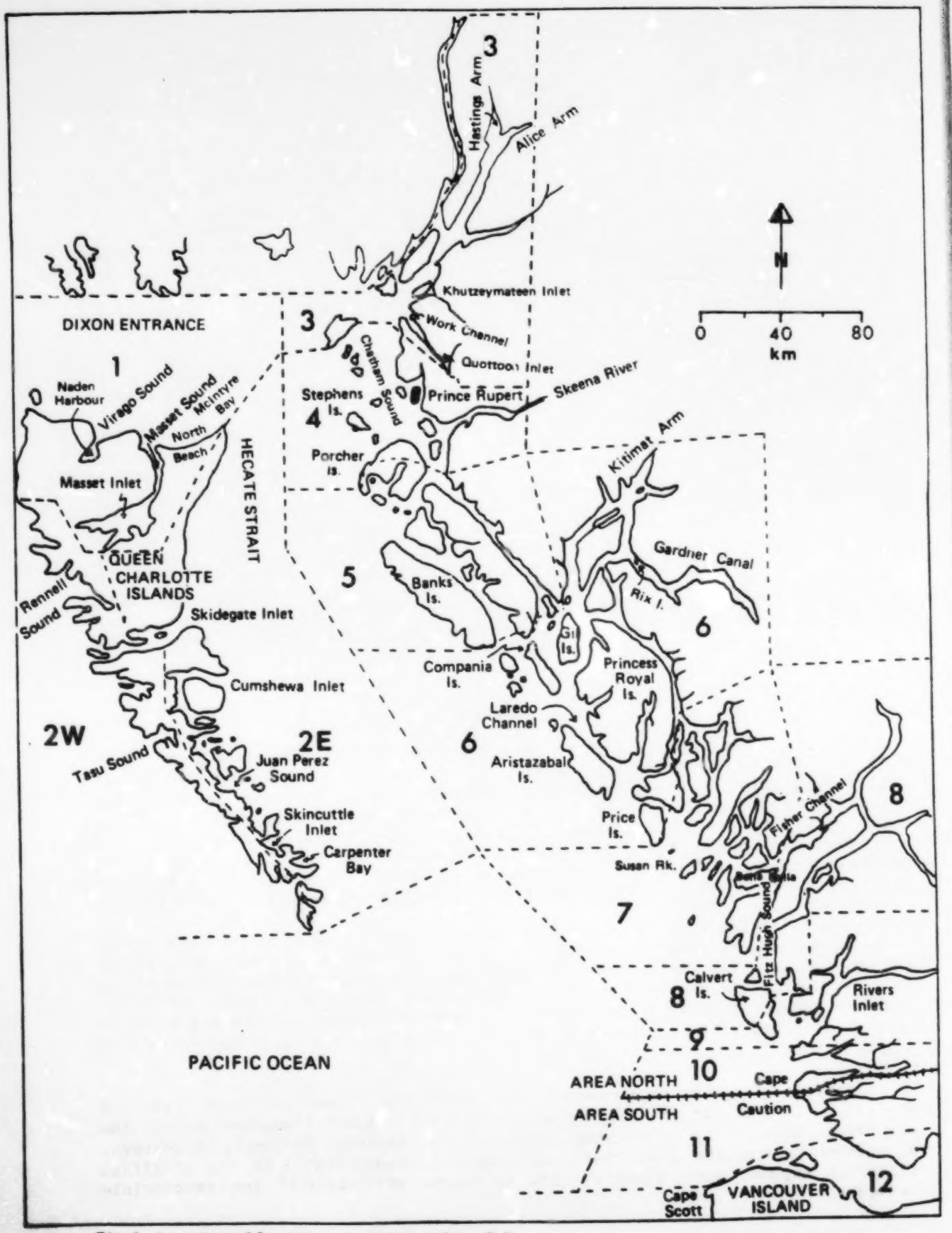


Fig. 1. Location of Statistical Areas in northern B.C.

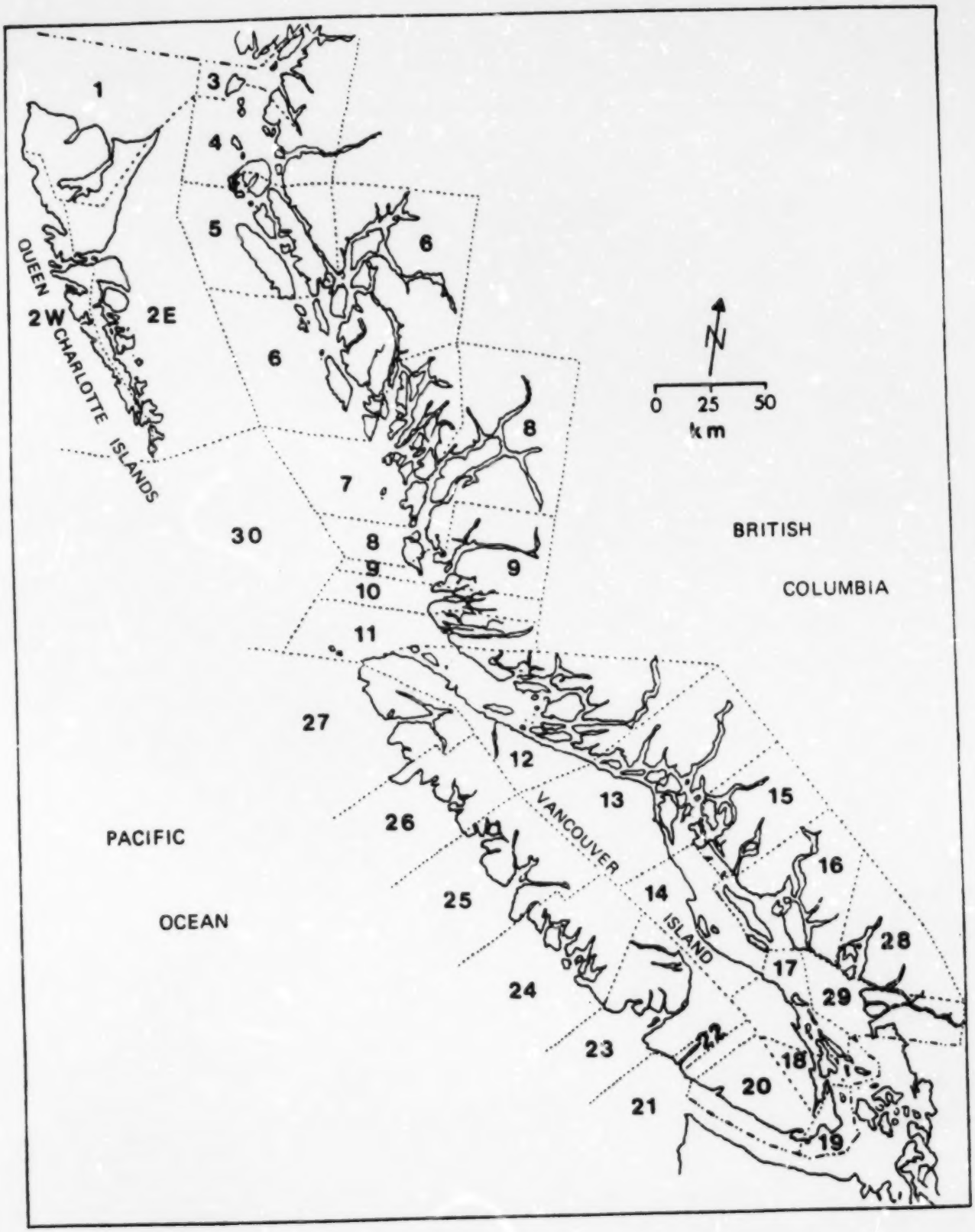


Fig. 2. Location of Statistical Areas in British Columbia.

Table 1. Category of licence required, landings and estimated value of shellfish fisheries in northern B.C., 1984.

Shellfish species	Licence	Landings (kg)	% of total B.C. coast	Value of northern B.C. catch ($1,000)[a]
Crab	C, A	295,671	25.5	1,167.9
Prawn	Z (H)	88,870	23.3	574.9
Abalone	E	45,733	78.9	418.5
Geoduck	G	574,206	16.5	482.3
Razor clam	PCFL	95,395	94.2	95.4
Shrimp	S	31,515	7.7	78.8
Octopus	Z (J)	11,121	44.4	22.1
Scallop	Z (B)	1,148	8.0	4.5
Squid	Z (E)	1,896	13.8	2.4
			Total est. value	$2,846,800

[a] These values are estimated from "average" prices for 1984, and are likely underestimates because of non-reporting. Each species includes catch by all gear including bicatch.

Table 2. Number of licensed vessels and their utilization in shellfish fisheries in British Columbia, 1984.

Shellfish species	No. eligible or issued licences in 1984[a]	No. licences with landings	No. licences with northern B.C. landings	Licence category required
Crab	5000+	386	55	C - licence and A - licence
Prawn	693	241	23	Z licence, no limited entry
Shrimp	243	110	25	S - licence, limited entry
Abalone	26	26	22	E - licence, limited entry
Geoduck	54	44	14	G - licence, limited entry
Squid	99	14	2	Z - licence
Octopus	84+13	113	31	Z - licence, with or without vessel, also incidental catches
Scallop	6	12	1	Z - licence, also incidental catches

[a] License status report, Dec. 1984. DFO Licence Department.

CRAB FISHERY

SPECIES HARVESTED

The target species of the B.C. crab fishery is mainly Dungeness crab (Cancer magister), although other species such as the red rock crab (C. productis) and graceful crab (C. gracilis) are also landed. A very small king crab fishery also exists with only one vessel specifically equipped for this fishery. In addition, in response to fishermen's inquiries, tanner crab (Chionocoectes tanneri) surveys have been initiated by the staff of the Pacific Biological Station in Nanaimo. However, tanner crab is not yet included on the licence schedule.

REGULATIONS

The primary basis of management of the Dungeness crab fishery is the minimum size limit of 165 mm along with gear regulation, and time and area closures (Appendix 1). Closures in the northern B.C. are based on both conservation and resource sharing concerns. Fluctuations in the abundance of Dungeness crab prevent a steady harvest, as reflected by the catch and effort statistics. For the rock crab fishery, a size limit of 115 mm is in effect. A size limit may be also recommended for the king crab fishery (Sloan and Somerton, in press) as a result of research surveys and concerns expressed by fishermen.

Vessels may fish for crab under a "C" licence (1,113 licences), and also under an "A" licence (4,233 licences), both of which allow the harvesting of other fish and shellfish species. Under this system, over 5,000 vessels are eligible to harvest crab, although less than 10% of that number are actually supported by this fishery.

LANDINGS

Butler (in press) reviews the history of the crab fishery in British Columbia. Historically, the northern B.C. areas have provided a large proportion of crab landings, with McIntyre Bay and Skeena area (Fig. 1) being the traditional commercial areas. Since the mid-1970's, however, the northern B.C. catch and thus also the coastwide total catch have fallen dramatically except for a small harvest peak in 1980 (1,698 tonnes coastwide). Total crab landings in northern B.C. were 210 tonnes in 1983 and 214 tonnes in 1984 (Fig. 3), compared to the coastwide B.C. harvest of 1,010 tonnes in 1984. Despite the reduction in landings from approximately 2,000 tonnes to less than 1,000 tonnes, the fleet size increased from 141 vessels in 1976 to 358 in 1980 (Butler 1984). In 1983 and 1984, 350 and 386 vessels respectively reported crab landings in the northern B.C.

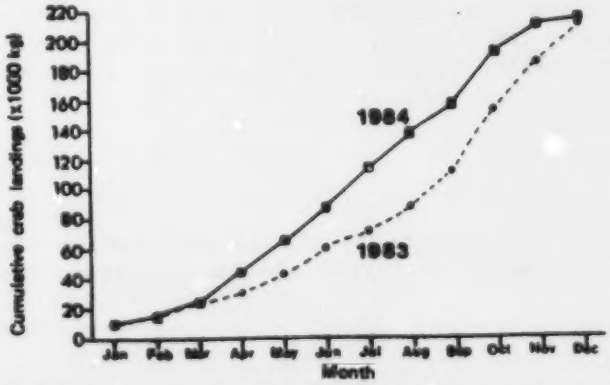


Fig. 3. Cumulative crab landings by month in northern B.C., 1983 and 1984.

The 1983 and 1984 monthly catch statistics for crab in northern B.C., as reported in the sales slip records (British Columbia Statistics, Department of Fisheries and Oceans, (DFO)), are given in Tables 3a and 3b respectively. Area 1 (McIntyre Bay and Hecate Strait) and Area 4 (Chatham Sound) (Fig. 1) supported most of the fishery in the north (90% in 1983; 82% in 1984), while contributions from Area 3 and the Central Coast (Areas 6-10) varied from year to year. In 1983, the most intense fishing for crab in northern B.C. occurred from September to December (50% of annual harvest) and in 1984 from April to October (80% of annual harvest) (Fig. 3, Table 3). The fishing time and effort were related to the timing and success of other fisheries, mainly salmon, and to weather conditions. It should be noted that, as with prawn fisheries, the crab fishing pressure is increasing as returns from salmon and herring fisheries diminish.

The ring trap fishery for crab in Naden Harbour (Area 1, Fig. 1) is small but fairly stable. In the 1940's, the annual catch averaged 100,000 pieces, with a mean of 50,000 pieces reported more recently (L. Enderud, DFO, pers. comm.)

The landings of king crab (Lithodes aequispina (golden) and Paralithodes camtschatica (red) are minimal and are included with other crab species with no breakdown by species. The landings of the golden and red king crab found in the deeper and shallower waters respectively, have originated from inlets in the northern B.C. The commercial fishery for golden king crab takes place predominantly in upper Area 3 (Alice Arm and Hastings Arm, Fig. 1), while the red king crab have been landed in Areas 3 to 5.

Sport and native food fisheries also use the crab resource. Although their use is largely undocumented, the Fisheries Research Branch in Nanaimo plans to initiate a sport fishing data collection system. Major sport fishing areas include Naden Harbour in Area 1, Prince Rupert Harbour and the surrounding area in Area 4 and Kitimat Arm in Area 6 (Fig. 1). Native food fisheries also use the above locations, as well as other areas around the 11 coastal villages in northern B.C.

SHRIMP FISHERY

The shrimp fishery in British Columbia utilizes six species, all members of the family Pandalidae. These shrimp are protandrous hermaphrodites, maturing first as males and then as females, and the management strategy reflects this characteristic. In the shrimp fishery, the target species vary depending on which of the two licenced gear types, trap or trawl, is used. Since these two fisheries differ considerably, they are described separately below.

SHRIMP FISHERY BY TRAP

Species harvested

The prawn (Pandalus platyceros) is the target species for trap harvesting north of Cape Caution. Prawns are larger and have correspondingly higher value

Table 3a. Crab landings (kg) by month and Statistical Area in northern B.C., 1983 (from crab trap sales slip records).

Statistical Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	% Total
1	2,680	913	3,195	3,230	6,063	6,373	5,330	-	2,290	13,044	15,738	10,862	69,718	33.0
2	-	723	609	495	-	-	-	632	174	5,308	-	-	7,948	3.8
3	-	-	-	-	363	1,409	1,195	454	2,359	1,401	-	8	7,189	3.4
4	5,611	6,136	3,413	2,285	5,662	9,450	4,157	15,012	18,112	22,043	14,174	12,750	118,805	56.7
5	-	-	-	-	159	-	-	-	-	-	1,288	1,220	2,667	1.3
6	-	-	122	624	-	-	57	-	521	-	1,150	-	2,474	1.2
7	-	-	-	-	-	-	-	140	-	-	-	-	140	<1
9	-	-	-	-	-	-	-	268	-	-	-	13	281	<1
10	101	-	-	174	-	-	63	-	-	-	-	-	338	<1
Total	8,392	7,772	7,339	6,808	12,247	17,232	10,802	16,506	23,456	41,796	32,350	24,853	209,553	
% By month	4.0	3.7	3.5	3.3	5.8	8.2	5.2	7.9	11.1	20.0	15.4	11.9		

Table 3b. Crab landings (kg) by month and Statistical Area in northern B.C., 1984 (from crab trap sales slip records).

Statistical Area	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	% Total
1	7,795	957	6,233	14,324	16,093	6,279	2,329	354	6,999	16,869	4,039	2,903	85,174	39.9
2E	-	-	-	-	-	166	-	-	1,215	2,454	-	-	3,835	0.8
2W	-	-	-	-	133	-	-	-	-	-	-	-	133	<.5
3	-	912	1,665	-	-	596	5,711	8,341	12	1,960	1,401	463	21,061	9.8
4	1,573	2,061	2,253	5,678	4,505	13,181	16,407	10,733	8,156	14,966	9,217	1,011	89,741	42.0
5	-	75	-	-	-	-	352	423	719	-	-	54	1,623	0.7
6	140	140	64	-	318	-	463	-	-	619	-	51	1,795	0.8
7	-	-	-	-	-	-	-	2,227	1,186	-	3,313	-	6,726	3.0
9	-	-	-	138	-	895	1,208	1,269	-	-	-	-	3,510	1.6
10	-	-	-	44	-	112	-	-	-	-	-	-	156	<1
Total	9,508	4,145	10,215	20,184	21,029	21,229	26,470	23,347	18,287	36,868	17,970	4,482	213,734	
% By month	4.4	1.9	4.8	9.5	9.8	9.9	12.4	10.9	8.6	17.3	8.4	2.1		

and quality than other shrimp. Humpback or king shrimp (P. hypsinotus) and pink shrimp (P. borealis) comprise the major portion of the prawn bicatch.

Regulations

The trap fishery is licensed under the "Z" licence (category "H") which includes a log book requirement. Logs are received and processed at the Pacific Biological Station in Nanaimo. As fishermen have historically sold a large portion of their catch over the side, landing records have represented only a fraction of the catch. However, with the shrimp fishery becoming more competitive and markets more formalized, sales slip records presently account for a greater portion of the catch. In 1983 and 1984, the log book system provided a cross check for sales slip records (Appendix 2).

The current management strategy involves the monitoring of commercial catches with the object of maintaining a minimum number of ovigerous females per trap. Until late 1983, sampling of catches in the northern B.C. was infrequent. Sampling data since that time are summarized in Appendix 3. Length frequency data provide an indication of the variation in shrimp growth rates (Appendix 4).

Although a size limit of 30 mm carapace length is proposed in current regulation changes for the shrimp fishery, no other restrictions on gear, area or catch are presently in effect. In 1984, 693 vessels were licensed in British Columbia to fish shrimp by trap.

Landings

Total catch by trap has risen steadily since the early 1970's when reported landings were less than 100 tonnes (Bernard 1982). In 1984, 241 licensed vessels reported total landings of 398 tonnes with northern B.C. contributing 92 tonnes (23% of total) from 23 vessels (Table 4a). Most of the northern B.C. catch comes from the Central Coast (Areas 6-10). For example, in 1984, 75% of the northern B.C. catch came from Areas 6,7 and 8 (Appendix 5). The landed value of the northern prawn fishery in 1984 was about $600,000 for 23 vessels or $26,000 per vessel. Although the fishery continues year round, 50% of the landings made in northern B.C. in 1984 occurred from June to September (Fig. 4).

SHRIMP FISHERY BY TRAWL

Species harvested

This fishery targets mainly on side-stripe (Pandalus dispar) and pink shrimp (P. borealis) with both species commonly found over muddy bottom. Prawn and king shrimp are caught in much smaller numbers depending on the substrate type.

Regulations

A fishing license is required to trawl for shrimp, and two types of gear are used: the beam trawl and the otter trawl (Butler and Boutillier 1983). The

Table 4a. Annual landings and effort for shrimp trap fishery, B.C., 1981 - 1984.

Year	British Columbia		Northern B.C.	
	Landing (tonnes)	No. days fished	Landings (tonnes)	No. days fished
1981	358	7,221	116	2,052
1982	281	7,248	71	1,718
1983	359	7,644	120	2,020
1984	398	9,117	92	1,553

Table 4b. Annual landings and effort for shrimp trawl fishery, B.C., 1981 - 1984.

Year	British Columbia		Northern B.C.	
	Landing (tonnes)	No. days fished	Landings (tonnes)	No. days fished
1981	582	3,612	19	305
1982	407	4,284	25	383
1983	382	6,714	17	419
1984	366	5,666	28	432

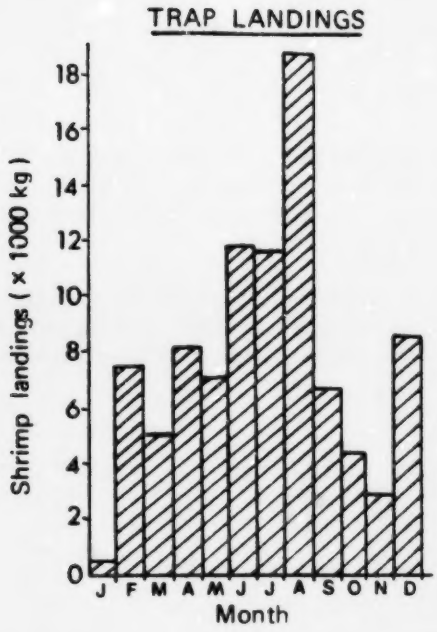


Fig. 4. Shrimp trap landings by month in northern B.C., 1984.

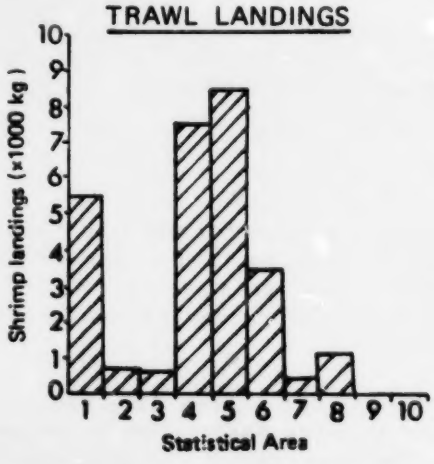


Fig. 5. Shrimp trawl landings by Statistical Area in northern B.C., 1984.

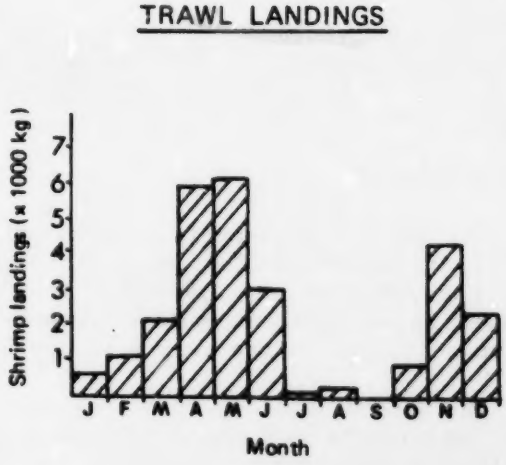


Fig. 6. Shrimp trawl landings by month in northern B.C., 1984.

smaller one-man beam trawl is hauled more slowly than the larger otter trawl and produces correspondingly smaller incidental catches. A Northern Permit System, in operation since 1979, has been incorporated into the "S" licence system in the latter part of 1984.

There are 243 vessels licensed for shrimp fishery by trawl in British Columbia, but many of these are unused and tied by regulation to other licenses. In 1984, only 110 vessels reported shrimp trawl landings coastwide.

Landings

In 1984, total reported catch for the shrimp trawl fishery in northern B.C. was 27.5 tonnes (7.5% of total B.C. catch); this was only slightly higher than the catches made during 1981 to 1983 (Table 4b). Catch data prior to 1980 are available in Bernard (1982). Catch per unit effort has been stable from 1980 through 1984.

In Chatham Sound (Areas 4 and 5, Fig. 1), the major shellfish fishery hosts mainly a small boat, beam trawl fishery on side-stripe, pink and king shrimp, with 60% of the northern B.C. catch by trawl originating there. Some fishing takes place in Masset and Skidegate Inlets in the Queen Charlotte Islands (Fig. 1) and also in parts of the Central Coast (Fig. 5). The trawl fishery occurs mainly from March to June and from November and December (Fig. 6), in contrast to the trap fishery which is spread over the year (Fig. 4).

GEODUCK FISHERY

GENERAL

The geoduck (Panope abrupta) fishery in British Columbia began in the southern B.C. waters in 1976 and expanded north of Cape Caution in 1980 (Harbo and Peacock 1983). The biology of the geoduck is reviewed by Harbo and Peacock (1983).

REGULATIONS

The geoduck fishery is managed by area quotas. Quotas for 1981 to 1984 are listed in Tables 5a and 5b. Although the total B.C. quota for the northern B.C. has remained at 2,000,000 lb (907 tonnes), the area quotas have been changed in order to stimulate exploration and thus the survey of new grounds, and to shift the effort away from any single area.

The geoduck biology is not generally well known, but ageing data have shown that individuals may reach 140 years (Breen and Shields 1983). This longevity requires a conservative approach regarding the harvest rate. Area quotas are established with reference to the "known area" of geoduck abundance and an average density, and the objective is to set quotas at 1% to 2% of the standing stock.

Table 5a. Annual geoduck quotas (lb) for northern B.C., 1981 - 1984.

Year	STATISTICAL AREA										
	1	2E	2W	3	4	5	6	7	8	9	10	Total
1981		400,000	200,000		400,000		350,000		350,000		300,000	2,000,000
1982												2,000,000
1983		650,000			350,000			1,000,000				2,000,000
1984	— [a]	650,000	— [a]		350,000			1,000,000				2,000,000

[a] Exploratory area, no quota.

Table 5b. Annual geoduck quotas (kg) for northern B.C., 1981 - 1984.

Year	STATISTICAL AREA										
	1	2E	2W	3	4	5	6	7	8	9	10	Total
1981		181,400	90,700		181,400		158,800		158,800		136,100	907,200
1982												907,200
1983		294,800			158,800			453,600				907,200
1984	— [a]	294,800	— [a]		158,800			453,600				907,200

[a] Exploratory area, no quota.

Commercial geoduck harvesting is restricted to those vessels with a "G" licence. Of the 54 vessels licenced in 1984, landings were reported from 44, and only 14 vessels reported fishing in the north (Table 2). One vessel was issued a licence for on-board processing ("P" licence) of geoducks in the northern B.C. A vessel must meet strict criteria set by the Inspection Branch in order to acquire the "P" licence. This licence was allowed for use only in the northern B.C. because of the lack of land-based processors in that region.

LANDINGS

In 1984, geoduck landings in northern B.C. totalled 574,200 kg with 415 fishing days expended (Table 6). Landings of geoducks since 1982 have shown an expansion of area fished with a large number of boats moving into Area 5 for the first time in 1984 (Table 7). There was limited fishing north of Cape Caution in 1982 due to regulation problems which allowed coastal rather than area closure. As a result, most of the 1982 geoduck quota was harvested in the southern B.C. which is a more economically profitable geoduck harvesting zone compared to the northern B.C.

ABALONE FISHERY

GENERAL

The abalone (Haliotis kamtschatkana) fishery in British Columbia has been reviewed in four previous reports (Bates 1984, 1985; Sprout 1983; Fedorenko and Sprout 1982). Data for this section were obtained from fishermen's harvest logs.

REGULATIONS AND SURVEYS

As in the previous year, 26 "E" licences were issued for this fishery in 1984, and the season began on January 15 and closed on December 15. The allowable coastwide catch for 1984 of 58,967 kg (130,000 lb) was a decrease of 11,793 kg (26,000 lb) from 1983. This decrease was precipitated by survey findings made in the spring of 1983 (Boutillier et al. 1985) which showed a dramatic decrease in abalone density in Area 6. The survey was a commitment made by the DFO to the abalone industry at the 1983 industry meeting. The allowable coastwide catch in 1984 was distributed equally to each licence so that each was assigned 2,268 kg (5,000 lb). Fishermen were allowed up to 4 quotas placed on one vessel resulting in 26 licences being fished by 16 vessels (Appendix 6).

A limited port sampling program has been carried out in the Prince Rupert area since 1982. The average size of the abalone per landing from this program has ranged from 106 mm to 117 mm with an average size of 112 mm for all sampled abalone (Appendix 7). From this sampling, no indication exists that fishing occurs down to the size limit of 100 mm. A 1984 survey in the Queen Charlotte Islands (Boutillier et al., in prep.) showed a continued decline in abalone density since 1978-79; however, no difference in density could be demonstrated between areas opened and areas closed to commercial fishing.

Table 6. Geoduck landings and fishing effort by Statistical Area (1 - 10) in northern B.C., 1984.

Statistical Area	Weight (kg)	No. days fished	% of northern B.C. catch	% of northern B.C. quota
2E	3,599	2	0.6	0.4
Queen Charlotte Islands Total	3,599	2	0.6	0.4
3	3,438	2	0.6	0.4
5	213,750	199	37.2	23.6
North Coast Total	217,188	201	37.8	23.9
6	7,986	10	1.4	0.9
7	108,916	72	19.0	12.0
8	182,679	96	31.8	20.1
9	53,832	26	9.4	5.9
Central Coast Total	353,413	204	61.6	39.0
Total for Areas 1-10	574,200	415	100.0	63.3

Table 7. Annual geoduck landings by Statistical Area (1 - 10) in northern B.C., 1981 - 1984.

Statistical Area	Landings (tonnes) by year							
	1981		1982		1983		1984	
2E	11		0		0		4	
3	0		0		0		3	
4	0		0		0			
5	84		0		0		214	
6	6		0		0		8	
7	370		227		207		109	
8	18		0		294		183	
9	0		0		0		54	
10	20		0		0		0	
Northern B.C. Total[a]	509	(18.8)	227	(7.2)	501	(18.3)	574	(16.5)
East Coast Vancouver Island Total[a]	547	(20.2)	409	(13.1)	570	(20.8)	1,174	(33.7)
West Coast Vancouver Island Total[a]	1,648	(60.9)	2,498	(79.7)	1,669	(60.9)	1,737	(48.5)
Total	2,704		3,134		2,740		3,483	

[a] Numbers in parenthesis indicate % of total B.C. catch.

In addition to commercial fishery, abalone are shore-picked in native food and recreational fisheries which are largely undocumented. Recreational diving and shore-picking are restricted to 24 abalone per person per day in the northern B.C. Regulations are being processed to lower the limit to 12 abalone per person per day.

LANDINGS

Of the 26 licences issued in 1984, 58% fished between 2,268 kg and 2,427 kg which is the maximum allowable catch that includes glaze allowance on frozen abalone (Appendix 8). The 1984 abalone catch on the B.C. coast totalled 57,264 kg (126,245 lb) (Appendix 9, Appendix Fig. 9-1) and was taken by 16 vessels with 24 divers (Appendix 6). Most of the catch was taken in Area 1 (25% of total B.C. catch) and Area 2E (22%), with lesser amounts in Area 6 (17%) and Area 20 (12%) (Fig. 7, Table 8, Appendix 10). The discrepancy between reported landings by logs and by sales slips is due to nonreporting of sales slips and poor location identification. Therefore, the data presented in Table 8 were based on the log data which are considered to be the more accurate data source. Abalone fishing effort by Statistical Area varied widely in 1984 and averaged 118 kg/diver day, which is below the levels recorded in 1977 to 1983 (Appendix 11, Appendix Fig. 11-1). As in the previous two years, the reported total B.C. catch in 1984 of 57,264 kg (126,245 lb) did not reach the allowable coastwide catch of 58,967 (130,000 lb).

CLAM FISHERY

SPECIES HARVESTED

Harvested species of clam include butter clams (Saxidomus giganteus), littlenecks (Protothaca staminea), manila clams (Venerupis japonica) and razor clams (Siliqua patula). Occasionally the cockle clams Clinocardum nultalli and the horse clams Tresus capax enter the commercial catch. The spread of manila clams to the north was first documented in a 1980 survey by Bourne and Farlinger (MS 1980).

REGULATIONS

Participation in the clam fishery is highly dependent on weather, success of other fisheries and employment rate. In addition, all of the northern B.C. is closed to bivalve shellfish harvesting by an order in council because of the risk of PSP (paralytic shellfish poisoning). However, it is possible to harvest these species provided an adequate sampling program is established before and during harvest, and the clams are delivered to a registered shellfish plant.

A personal commercial fishing licence is required to hand-dig for clams. Mechanical diggers require special permits. Size limits are 63 mm for butter clams, 38 mm for littleneck and manila clams and 90 mm for razor clams.

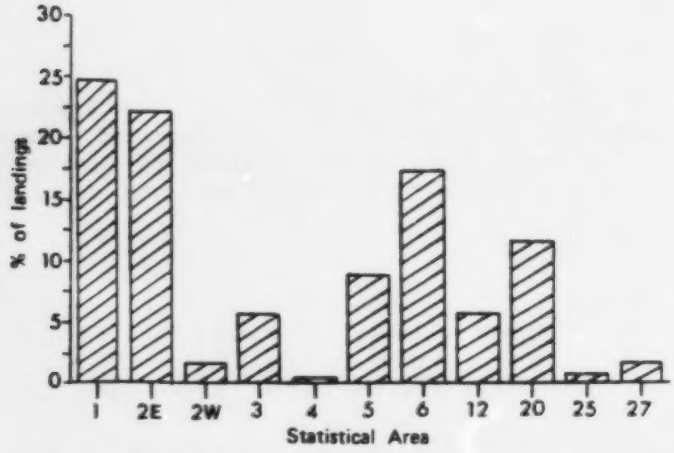


Fig. 7. Proportion of British Columbia abalone catch by Statistical Area, 1984

Table 8. Abalone landings by Statistical Area (1 - 27) B.C., 1984.

Statistical Area	Landings (kg) (from logs)	Landings (kg) (from sales slips)	% of B.C. landings (from logs)
1	14,192	6,347	24.7
2E	12,670	8,510	22.1
2W	938	0	1.6
Queen Charlotte Islands Total	27,800	14,857	48.4
3	3,181	13,313	5.6
4	236	245	0.4
5	4,990	6,927	8.7
North Coast Total	8,407	20,485	14.7
6	9,899	5,878	17.3
7	0	2,268	0.0
8	0	2,245	0.0
Central Coast Total	9,899	10,391	17.3
12	3,270	3,507	5.7
20	6,593	5,969	11.5
21	0	193	0.0
25	389	389	0.7
27	907	715	1.6
South Coast Total	11,158	10,773	19.5
B.C. Total	57,264	56,506	100.00

LANDINGS

Catch statistics for clams have been poor historically, with Quayle and Bourne (1972) providing landing data prior to 1970. Until the PSP closure in 1963, the northern B.C. contributed 50% to 75% to the recorded clam catch (razor, butter and littleneck) in British Columbia. From that time until the early 1970's, landings (except razor clams) were minimal (Quayle and Bourne 1972; Bourne and Farlinger MS 1980). Landings since then have been made sporadically and under permit, and virtually all the catches consisted of butter clams as transportation of the smaller, fresh steamer clams has been a problem. Landings from 1980 until the present time fall into two categories: razor clams from Area 1 and butter clams from Areas 3 to 6 (Table 9). Landings of horse clams which are also fished by geoduck divers, are noted separately. The only record of horse clam landings north of Cape Caution is one for 5 tonnes landed in 1981 at the same time as geoduck landings from the same area.

The only sustained clam fishery takes place at North Beach in Area 1 on razor clam. Catch statistics for razor clam fishery in Area 1 are given in Table 10 (L. Enderud, DFO, pers. comm.). Razor clams have been sold primarily as bait but with the collapse of the Washington state razor clam fishery, Area 1 razor clams were sold as food in 1984.

Other species of clam have been harvested periodically north of Cape Caution under permit, but there was no activity in 1983 or 1984.

OCTOPUS FISHERY

REGULATIONS

A "Z" licence is required for eligibility to fish octopus (Octopus dolfeini) commercially whether fishing from shore or from a vessel. Octopus fishing regulations prohibit the use of any sharp pointed instrument, any chemicals in the intertidal zone, or copper sulphate in all waters.

LANDINGS

Landings of octopus have been reported on the B.C. coast since 1964 (Bernard 1982). These landings have consisted of incidental octopus catches from trawl operations, long-line operations and to a lesser extent from crab and prawn traps as well as catches from a directed diving fishery. The 1984 landings of octopus in northern B.C. totalled 10,892 kg (24,013 lb), with 38% of that catch taken in Area 5 (Table 11). Of the total northern B.C. catch, 51% were taken by trawl gear, 24% by traps and 17% by divers (Table 12).

SCALLOP FISHERY

SPECIES HARVESTED

Three species of scallop are fished in British Columbia: weathervane

Table 9. Annual clam landings (tonnes) by Statistical Area (1 - 10) in northern B.C., 1970 - 1984.[a] (Note: Area 1 landings are 95%-100% razor clams; other area landings are predominantly butter clams).

Statistical Area	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Area Total
1	181.0	616.0	23.8	76.0	70.8	26.3	81.7	70.8	48.0	113.0	75.0	16.6 (22.1)[b]	48.4 (41.0)[b]	21.0 (19.9)[b]	105.0 (103.0)[b]	1,573.2 (1,568.2)[b]
2	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0
3	-	-	-	-	3.2	-	1.4	-	-	1.0	1.0	9.0	-	-	-	15.5
4	-		-	-	81.7	23.6	95.7	64.4	76.0	163.0	181.0	29.3	-	-	-	714.7
5	-	-	-	-	70.3	137.9	211.4	167.4	167.0	221.0	222.0	-	-	-	-	1,197.0
6	-	-	-	-	32.7	54.4	97.1	122.0	20.0	3.0	16.0	-	-	-	-	345.2
7	-	-	101.1	0.7		-	20.9	3.6	-	5.0	-	-	-	-	-	131.2
8	-	591.9	21.0	3.2	-	-	-	-	-	-	3.0	-	-	-	-	619.1
9	266.3	3.6	-	1.4	-	9.5	-	-	-	7.0	-	-	-	-	-	287.8
10	-	-	-	-	-	13.2	-	-	-	-	-	0.1	0.1	-	-	13.4
Northern B.C. Total	447.3	1,121.6	145.8	81.2	258.6	264.9	508.0	428.2	311.0	513.0	498.0	56.0	48.5	21.0	105.0	4,898.0
% Razor clam in northern B.C.	40.5	50.8	11.5	93.3	26.8	9.6	34.9	16.2	12.5	19.5	15.1	39.1	98.8	98.1	90.9	-
B.C. coast total	10,489.4	11,554.0	1,559.2	714.4	11,964.8	1,173.0	1,178.9	1,388.9	1,587.0	1,612.0	1,632.0	806.6	1,479.7	1,762.1	2,453.0	51,355.1

[a] From B.C. Catch Statistics.
[b] In cases where the local officers' information is considered more accurate, it is used with the catch statistic in parenthesis.

Table 10. Annual landings of razor clams in Area 1, B.C., 1979 - 1984 (L. Enderud, DFO, pers. comm.).

Year	Landings (kg)
1979	100,747
1980	75,020
1981	16,404
1982	40,835
1983	19,964
1984	102,994[a]

[a] Sales slip data show 95 tonnes as opposed to 103 tonnes shown above.

Table 11. Octopus landings by Statistical Area in northern B.C., 1984.

Statistical Area	Weight (kg)	% of northern B.C. landings
1	419	3.9
2E	2,046	18.8
2W	153	1.4
Queen Charlotte Islands Total	2,618	24.0
3	473	4.3
4	2,064	19.0
5	4,095	37.6
North Coast Total	6,632	60.9
6	1,272	11.7
7	268	2.5
8	102	0.9
Central Coast Total	1,642	15.1
Total Areas 1 to 10	10,892	100.0
Total Areas 1 to 27	25,046	

Table 12. Octopus landings by gear type in northern B.C., 1984.

Gear type	Weight (kg)	% of northern B.C. landings
Troll & handline	13	0.1
Troll (freezer)	140	1.3
Longline	764	7.0
Trawl	5,556	51.0
Midwater trawl	4	0.04
Diving	1,833	16.8
Other traps	2,582	23.7
Total gear	10,892	100.0

scallop (Pectin patinopectin), pink scallop (Chlamys rubida) and spiny scallop (Chlyamys hastata). In addition, the purple hinged rock scallop Hinnites gigantea is taken in the diving sport fishery.

REGULATIONS

The scallop fishery is licensed under the "Z" licence (category "B") which permits fishing with a dredge or diving. In the northern B.C., only the deeper water weathervane scallops are fished and so far, this fishery has been experimental. A minimum size limit of 120 mm shell height, measured from the hinge to the ventral margin of the shell, is proposed for the weathervane scallop fishery. Two operators have requested permits to fish for scallops in the northern B.C. in 1985.

LANDINGS

In 1984, 1,428 kg of weathervane scallops were landed from trawl bicatch. This was 8% of the total B.C. scallop landings (171,913 kg).

SQUID FISHERY

REGULATIONS

A "Z" licence is required to fish for squid (Loligo opalescens) by seine and by hook and line.

LANDINGS

There are limited records of squid fisheries on the B.C. coast and the marketed catch is usually an incidental catch from the prawn, shrimp and trawl fisheries. In 1984, landings of squid totalled 1,896 kg (4,180 lb) with 91% of the catch taken incidentally by the trawl fishery in Areas 1 and 2E (Table 13). Landings from Areas 5 and 6 were taken by seines.

Table 13. Squid landings by Statistical Area in northern B.C., 1984.

Statistical Area	Gear type	Weight (kg)	% of northern B.C. landings
1	Trawl	1,367	72
2E	Trawl	356	19
5	Seine	159	8
6	Seine	14	<1
	Trawl total	1,723	91
	Seine total	173	9
Total northern B.C.		1,896	100
Total B.C. coast		13,679	

ACKNOWLEDGEMENTS

Thanks are extended to M. Rosner and D. McMullin of the Statistics Section, and to Marian McGavin of the Licence Division for their assistance in locating the shellfish fishery data. S. Pranjivan typed the drafts, while the staff of the REP/Information Processing Center typed the final report. P.E. Sprout and L.V. Gordon reviewed the manuscript, and A. Fedorenko drafted the figures, edited the report and prepared it for publication.

REFERENCES

Bates, K.T. 1984. Review of the 1982 commercial abalone fishery in British Columbia. Can. MS. Rep. Fish Aquat. Sci. 1749:22 p.

Bates, K.T. 1985. Review of the 1983 commercial abalone fishery in British Columbia. Can. MS. Rep. Fish Aquat. Sci. 1826:25 p.

Bernard F.R. (ed.) 1982. Assessment of invertebrate stocks off the west coast of Canada (1981). Can. Tech. Rep. Fish Aquat. Sci. 1074:iv+39 p.

Bourne, N. and S. Farlinger. MS 1980. A survey of clam beaches in the Central Coast. May 1980. Department of Fisheries and Oceans, B.C.

Boutillier, J.A., W. Carolsfeld, P.A. Breen and K. Bates. (in prep.) Abalone survey in the Estavan Group and Aristazabal Island, May 1983. Can. MS. Rep. Fish Aquat. Sci. 1747:iv+60 p.

Boutillier, J.A., W. Carolsfeld, P.A. Breen, S. Farlinger and K.T. Bates 1985. Abalone resurvey in the south-east Queen Charlotte Islands, July 1984. Can. MS Rep. Fish Aquat. Sci. 1818: 87 p.

Breen, P.A. and T.L. Shields. 1983. Age and size structure in five populations of geoduck clams (Panope generosa) in British Columbia. Can. Tech. Rep. Fish. Aquat Sci. 1169:iv+62 p.

Butler, T.H. 1984. Dungeness crab. Underwater World Factsheet. Communications Directorate, Department of Fisheries and Oceans, Ottawa, Ontario. K1A 0E6

Butler T.H. (in press) The Dungeness crab (Cancer magister): its biology and utilization. Bull. Can. Fish. Aquat. Sci.

Butler T.H. and J. Boutillier. 1983. Selected shrimps of British Columbia. Underwater World Factsheet, Communications Directorate, Department of Fisheries and Oceans, Ottawa, Ontario, K1A 0E6.

Fedorenko, A.Y. and P.E. Sprout. 1982. Abalone biology, fishery regulations, commercial catch (1952-1980), and current state of resource in British Columbia. Can. MS Rep. Fish Aquat. Sci. 1658:74 p.

Harbo, R.M. and S.D. Peacock. 1983. The commercial geoduck clam fishery in British Columbia, 1976-1981. Can. MS Rep. Fish. Aquat. Sci. 1712: vii + 40 p.

Quayle, D.B. and N. Bourne. 1972. The clam fisheries of British Columbia, Fish. Res. Board Can. Bull. 179:70 p.

Sloan, N.A. and D.A. Somerton. (in press) Size at sexual maturity and fecundity of fjord-dwelling golden crab, Lithodes aequispina Bedict from northern British Columbia J. Crust Biol.

Sprout, P.E. 1983. Review of 1981 commercial abalone fishery in British Columbia. Can. MS Rep. Fish Aquat. Sci. 1692:23 p.

Appendix 1. Commercial crab closures in northern B.C. (Areas 1-10).

Area	Location	Type of closure	Time
1-4	Naden Hbr.	Closed to traps, rings only	Annual year around
		Soft shell	May 1 to Sep. 30
1-5	McIntyre Bay	Soft shell	Annual July 10 to Sep. 30
3-18	Iceberg Bay	Closed to commercial fishing	Annual year around
4-10	Prince Rupert Hbr. Porpoise Hbr. Morse Basin Wainwright Basin	Closed to commercial fishing	Annual year around
6-1	Kitimat Arm	Closed to commercial fishing	Annual year round
6-2	Hartley Bay	Closed to commercial fishing	Intended for 1985 Apr. 30 - Oct. 1
8	Bella Coola	Closed to commercial fishing	Annual year round
9-2,3,4,	Johnston, Goose Allard and Draney Creek Bays	Closed to commercial fishing	First closure Aug. 21, 1984 to Dec. 31, 1984

Appendix 2. Comparison of catch statistics from shrimp trap "Z" logs and sales slip data for 1984.

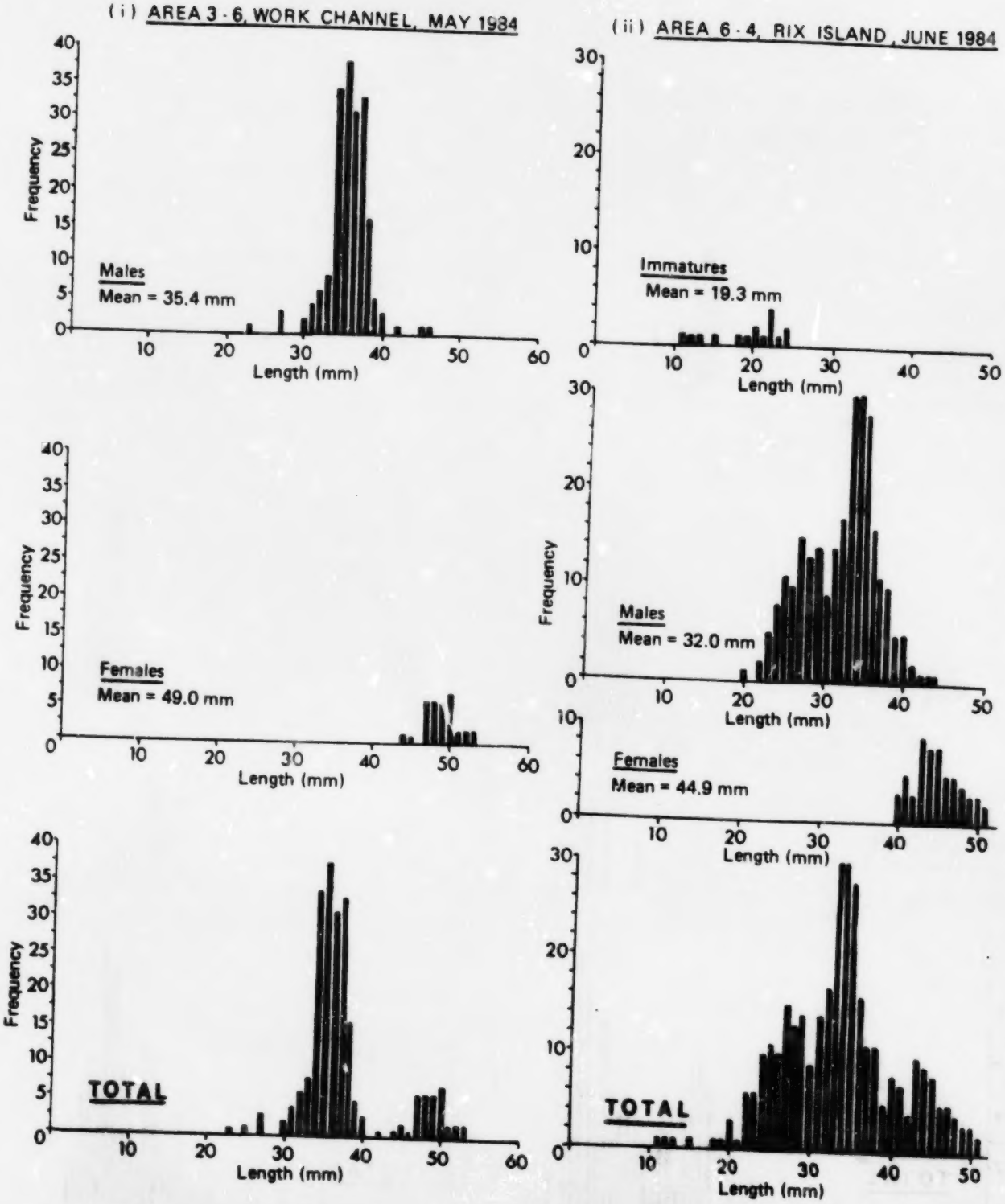
Estimated number of boats fishing shrimp by traps = 305

Number of boats submitting logs (% of total) 176 (71%)	Number of boats not submitting logs (%) 88 (29%)
Number of boats submitting sales slips (%) 232 (76%)	Number of boats not submitting sales slip (%) 72 (24%)
Estimated catch = 399,057 kg	
Catch reported in logs (%) 399,057 (79%)	Catch not reported in logs (%) 104,256 (21%)
Catch reported on sales slips(%) 379,901 (75%)	Catch not reported on sales slips(%) 123,412 (25%)

N.B. - There is no estimate of catch from boats which submitted neither sales slips nor log books.

Appendix 3. Commercial sampling summary for northern B.C. shrimp trap fishery to January 1, 1985.

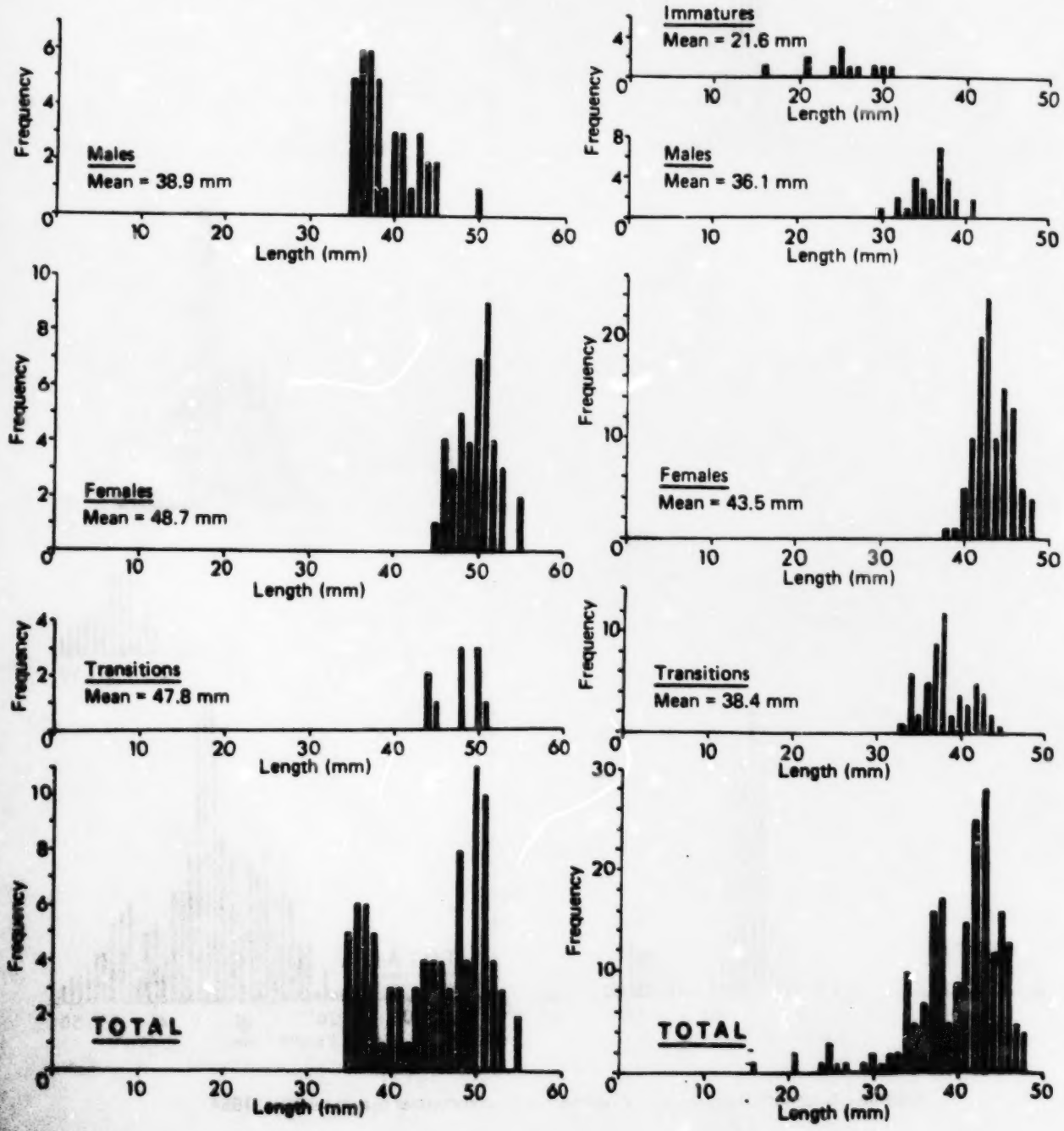
Statistical Area	Location (Fig. 1)	Date	Spawn Index	Male length (mm)	Female length (mm)	Transition length (mm)
3	Khutzeymateen Inlet	04/10/83	3.08			
3	Quatoon Inlet	05/10/83	0.70			
			3.67			
3		27/10/83	1.00			
			0.40			
			0.57			
3	Work Channel	15/05/84	4.38	36.23	43.84	38.70
			13.20	36.08	41.11	37.95
6	Gardner Canal	16/04/84	7.25			
			0.73			
6	Rix Island	26/06/84	4.90	38.88	48.65	47.74
			3.88			
			4.83			
7	S. of Susan Rk.	16/08/84	4.38	35.65	45.77	
			8.00			
8-14	Kwatna Inlet	29/09/84	0.95			
8-4	Fisher-Fitz Hugh	30/09/84	2.40	31.96	44.87	37.86



Appendix 4. Length frequencies for northern B.C. commercial prawn samples, 1984.

(iii) AREA 8-4, SEA OTTER INLET
SEPTEMBER 1984

(iv) AREA 8-14, KWATNA INLET
SEPTEMBER 1984



Appendix 4 (cont'd). Length frequencies for northern B.C. commercial prawn samples, 1984.

Appendix 5. Shrimp trap landings by Statistical Area in northern B.C., 1984.[a]

Statistical Area	Landings (kg)	% Of northern B.C. landings
1	172	<1
2	414	<1
3	2,706	2.9
4	4,784	5.2
5	7,530	8.1
6	37,840	40.8
7	17,301	18.6
8	14,793	15.9
9	1,610	1.7
10	5,664	6.1
Total northern B.C.	92,814	100
Total B.C.	397,870	

[a] For catch statistics to 1980, see Bernard (1982).

Appendix 6. Mean annual abalone catch per vessel and diver, and fishing effort, B.C., 1977-1984.

Year	1977	1978	1979			1980	1981	1982	1983	1984
			Total	Open	Quota					
Number of vessels	22	25	25	21	24	25	24	22	22	16
Number of divers	56	78	59	-	-	33	32	28	28	24
Mean catch (kg)										
per vessel	21,582	16,160	8,352	5,190	4,159	4,129	3,902	3,733	2,543	3,579
per diver	8,479	5,180	3,539	-	-	3,128	2,927	2,933	1,998	2,386
Number of diver days per vessel										
Mean	109	86	54	31	29	32	29	27	21	30
Range	3-327	8-204	-	8-54	16-48	13-73	12-58	10-78	10-55	6-71
per diver										
Mean	43	28	23	-	-	25	22	22	16	20
Range	1-100	1-69	1-67	-	-	6-58	1-52	2-54	1-55	3-49
Catch per diver day (kg/day)										
Mean	199	187	155	-	-	131	142	136	124	118
Range of mean catch per diver day										
per vessel	72-340	49-354	-	49-585	62-282	70-349	67-325	58-301	34-634	14-195
per diver	32-763	5-385	23-278	-	-	40-349	35-287	28-301	34-634	14-195

Appendix 7. Annual abalone port sampling summary, Prince Rupert, B.C., 1982-1985.

Date	Statistical Area of fishing	Sample size	Average abalone length (mm)	Standard deviation (mm)	% Legal size abalone
Oct. 1982	6	292	115.41	9.44	NA[a]
Dec. 1982	6	370	115.84	21.73	99.73
Feb. 1983	6	137	106.74	5.65	96.35
Mar. 1983	6	125	109.78	6.39	97.60
Dec. 1984	6	117	109.81	8.00	100.00
		104	106.25	18.14	96.15
Sample total		221	108.14	6.98	98.19
Dec 1984	6	49	113.33	9.60	100.00
Dec. 1984	1	99	110.10	8.18	95.96
		88	112.11	8.44	100.00
Sample total		187	111.05	8.34	97.86
Dec. 1984	6	28	114.96	7,46	100.00
		25	112.44	7.10	100.00
		27	110.15	7.76	96.30
Sample total		80	112.55	7.63	98.75
Feb. 1985	5	10	117.40	7.12	100.00
		10	113.20	7.41	100.00
		10	113.10	7.94	100.00
		10	113.50	10.17	100.00
Sample total		40	114.30	8.13	100.00
Apr. 1985	1	35	114.66	9.80	100.00
		30	110.07	9.45	100.00
Sample total		65	112.54	9.84	100.00
Grand total		1,565	-	-	-
Overall average		87	112.40	13.08	98.59

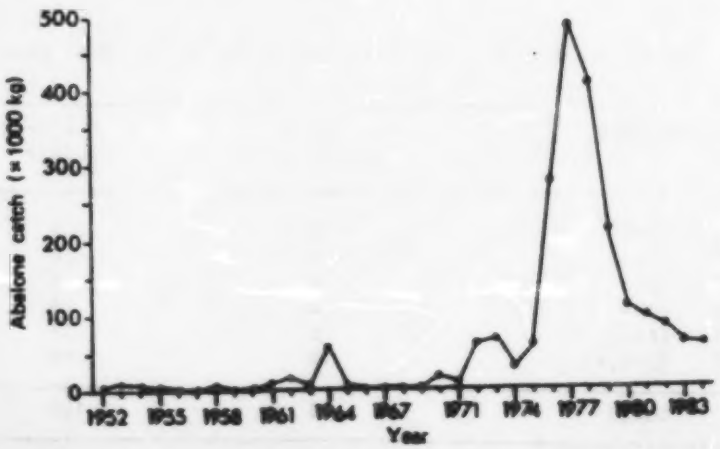
[a] Not available.

Appendix 8. Range in abalone landings per licence holder, B.C., 1984.

Range in landings kg	Range in landings lb (X 1000)	No. licence holders	% Of licence holders
0 - 454	(0-1)	0	0
454 - 907	(1-2)	0	0
907 - 1,361	(2-3)	0	0
1,361 - 1,814	(3-4)	2	8
1,814 - 2,268	(4-5)	9	35
2,268 - 2,427	(5-5.4)	15	58
	Total	26	100

Appendix 9. Annual total landings of abalone in B.C. 1952-1984.

Year	Landings (kg)	Landings (lb)
1952	5,398	11,900
1953	10,342	22,800
1954	6,849	15,100
1955	3,583	7,800
1956	499	1,100
1957	953	2,100
1958	5,307	11,700
1959	181	400
1960	1,542	3,400
1961	9,389	20,700
1962	17,563	38,700
1963	5,715	12,600
1964	57,062	125,800
1965	3,084	6,800
1966	726	1,600
1967	862	1,900
1968	91	200
1969	635	1,400
1970	16,239	35,800
1971	6,441	14,200
1972	59,602	131,400
1973	67,131	148,000
1974	26,308	58,000
1975	56,699	125,000
1976	273,061	602,000
1977	474,809	1,046,775
1978	404,003	890,674
1979	208,798	460,321
1980	103,222	227,563
1981	93,652	206,467
1982	82,135	181,077
1983	55,946	123,340
1984	57,264	126,245
Total	2,117,859	4,669,079



Appendix Fig. B - 1. Annual British Columbia abalone catch, 1952 - 1984.

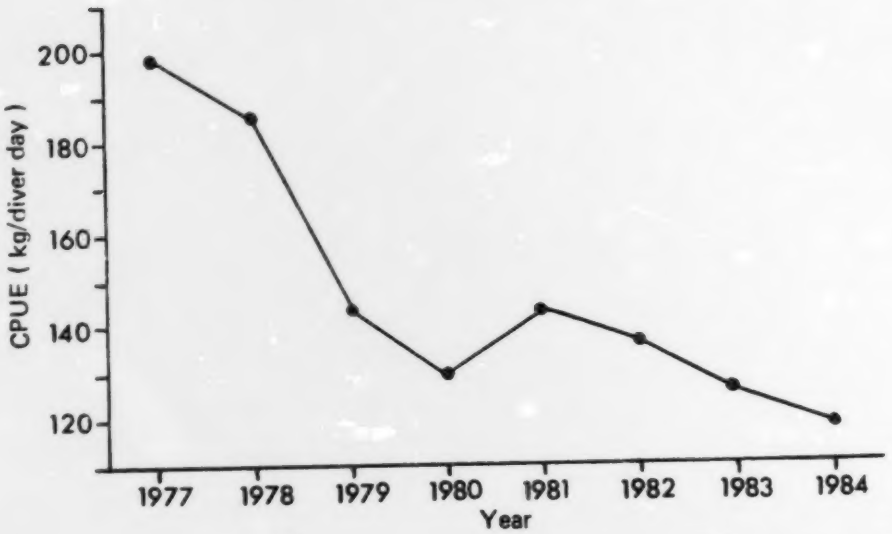
Appendix 10. Annual abalone catch (kg) by Statistical Area, B.C., 1977-1984 (from log books).

Statistical Area	1977	1978	1979	1980	1981	1982	1983	1984	Total
1	45,667	12,888	2,613	3,196	1,923	13,024	12,113	14,192	105,616
2W	13,174	13,362	5,726	3,724	6,047	161	0	938	43,133
2E	251,667	102,430	29,528	12,537	21,321	13,539	17,935	12,670	461,627
Queen Charlotte Islands Total	310,508	128,680	37,868	19,457	29,291	26,723	30,047	27,801	610,376
3	10,186	254	0	2,143	0	1,667	0	3,181	17,430
4	0	6,388	2,928	2,692	5,186	1,383	875	236	19,688
5	94,586	88,289	40,407	13,483	2,858	2,201	3,970	4,990	250,785
North Coast Total	104,771	94,931	43,335	18,318	8,044	5,252	4,846	8,407	287,903
6	33,751	160,268	88,971	44,519	37,756	27,058	7,538	9,899	409,759
7	5,601	10,922	11,534	1,943	1,778	898	3,234	0	35,910
8	0	0	0	245	0	0	145	0	390
9	0	0	0	299	553	0	0	0	852
10	0	0	0	0	0	1,124	0	0	1,124
Central Coast Total	39,352	171,190	100,504	47,006	40,088	29,079	10,917	9,899	448,035
11	186	0	5,548	1,001	1,828	3,541	0	0	12,104
12	9,135	459	17,312	14,047	9,595	5,052	2,452	3,270	61,322
20	1,430	3,026	1,689	2,004	4,805	8,603	7,684	6,593	35,835
23	0	0	0	0	0	1,000	0	0	1,000
24	180	0	0	0	0	18	0	0	197
25	4,554	5,718	577	0	0	0	0	389	11,237
26	2,332	0	209	0	0	0	0	0	2,541
27	2,362	0	1,756	0	0	2,866	0	907	7,891
South Coast Total	20,178	9,203	27,091	17,052	16,229	21,080	10,136	11,158	132,126
Unknown	0	0	0	1,389	0	0	0	0	1,389
B.C. Total	474,809	404,003	208,798	103,222	93,652	82,135	55,946	57,264	1,479,829

Appendix 11. Annual abalone fishing effort by Statistical Area, B.C., 1977-1984.

Statistical Area	1977		1978		1979		1980		1981		1982		1983		1984	
	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)	Total diver days	CPUE/ diver day (kg)
1	211	216.4	59	218.4	20	130.7	21	152.2	5	384.6	48	271.3	62	195.4	104	136.5
2W	75	175.7	80	167.0	63	90.9	21	177.3	5	1,209.5	1	161.0	0	0	16	58.6
2E	1,111	226.5	547	187.3	134	220.4	48	261.2	126	169.2	116	116.7	119	150.7	89	142.4
Queen Charlotte Islands Total	1,397	222.3	686	187.6	217	174.5	90	216.2	136	215.4	165	162.0	181	166.0	209	133.0
3	51	199.7	5	50.7	0	0	14	153.1	0	0	13	128.2	0	0	30	106.0
4	0	0	30	212.9	40	73.2	16	168.3	47	110.3	14	98.8	13	67.3	4	59.0
5	470	201.3	506	174.5	347	116.5	104	129.6	28	102.1	31	66.7	35	113.4	49	101.8
North Coast Total	521	201.1	541	175.5	387	112.0	134	136.7	75	107.3	60	87.5	48	101.0	83	101.3
6	251	134.5	761	210.6	449	198.2	381	116.9	264	143.0	186	145.5	70	107.7	69	143.5
7	51	109.8	101	108.1	86	134.1	32	60.7	24	74.1	5	179.6	31	104.3	0	0
8	0	0	0	0	0	0	2	122.5	0	0	0	0	4	36.3	0	0
9	0	0	0	0	0	0	6	49.8	3	184.5	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	11	102.1	0	0	0	0
Central Coast Total	302	130.3	862	198.6	535	187.9	421	111.7	291	137.8	202	144.0	105	104.0	69	141.5
11	11	16.9	0	0	42	132.1	6	166.8	3	609.5	19	186.4	0	0	0	0
12	95	96.2	6	76.5	126	137.4	130	108.1	92	104.3	58	87.1	26	94.3	35	91.4
20	16	89.4	33	91.7	21	80.4	19	105.5	63	76.3	71	121.2	91	84.4	78	84.5
23	0	0	0	0	0	0	0	0	0	0	7	142.9	0	0	0	0
24	4	44.9	0	0	0	0	0	0	0	0	1	17.5	0	0	0	0
25	16	284.6	34	168.2	4	144.1	0	0	0	0	0	0	0	0	3	129.6
26	14	166.6	0	0	3	69.6	0	0	0	0	0	0	0	0	0	0
27	11	214.8	0	0	13	135.1	0	0	0	0	19	150.8	0	0	8	113.3
South Coast Total	167	120.8	73	126.1	209	129.6	155	110.0	158	102.7	175	120.5	117	86.6	124	90.0
Total	2,387		2,162		1,348		800		660		602		451		485	
Mean[a]		198.9		186.9		154.9	+10.5	129.0[b]		141.9		136.4		124.1		118.1

[a] Total catch/Area/Total diver days.
[b] 1,389 kg of unknown fishing effort; CPUE based on remaining catch.



Appendix Fig. 11 - 1. Annual CPUE (kg/diver day) for B.C. abalone fishery, 1977 - 1984.